New Cortex

AI is not (just) automation: Best practices for achieving new levels of scalability

Don M. Dini

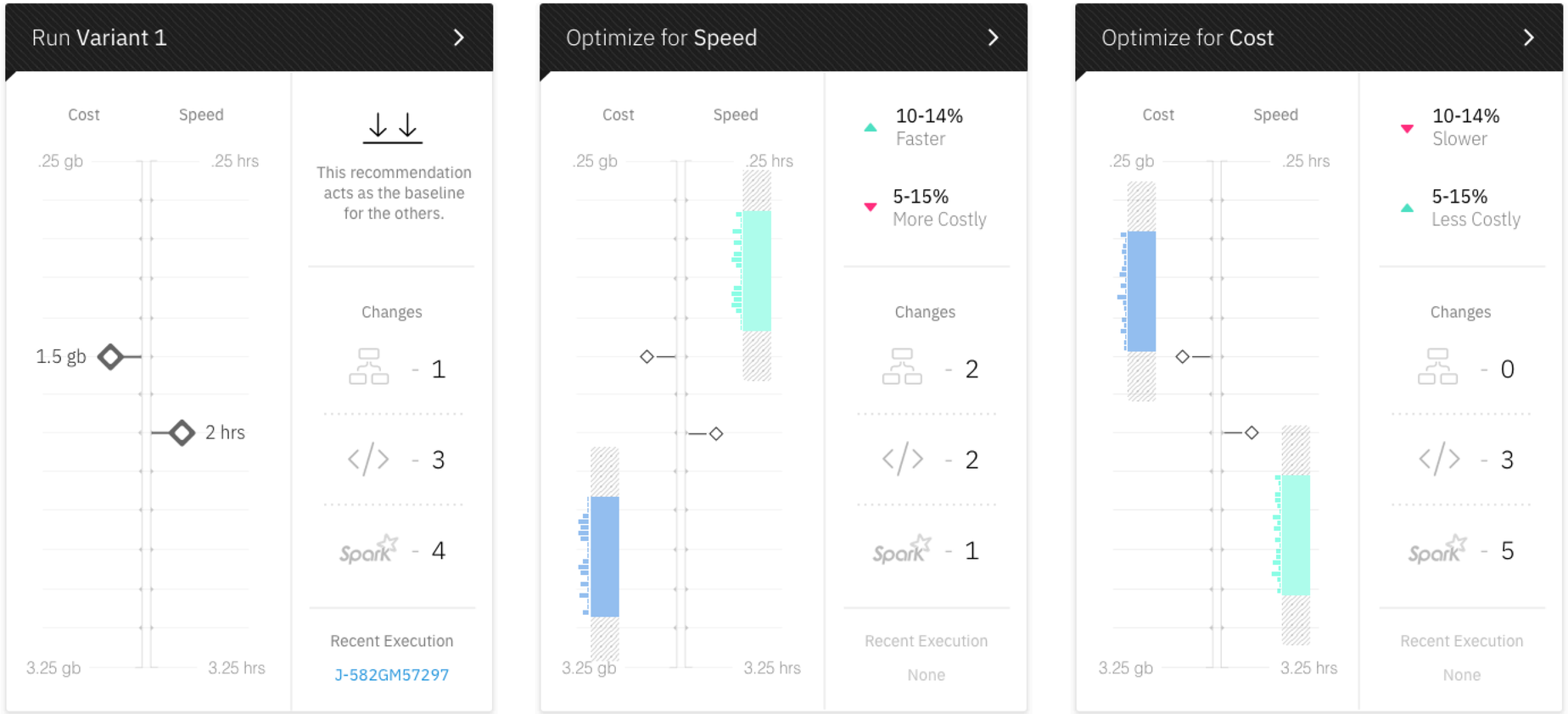
11/7/2018

About me

- Background in CS and AI
- Lecturer in CS at USC
- A few startups
- Data scientist at AT&T
- The theme: Applying AI research to build systems and solve problems.

About me

Today - Lead AI Engineer at New Cortex



NEW CORTEX

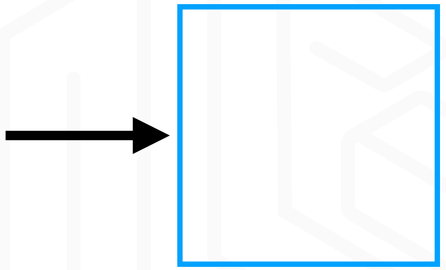
Today

- AI vs automation
- The practice of integrating intelligent systems

AI and Automation

- Suppose you have a task you perform (multiple times) each day

- Suppose you have a task you perform (multiple times) each day



- *Ssh into machine*
- *Download latest package*
- *Set permissions*
- *Run tests*
- *Deploy*

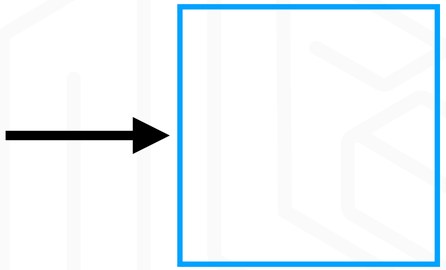
- At some point, you decide to turn this into a program

deploy_script.py

```
0 Ssh into machine
1 Download latest package
2 Set permissions
3 Run tests
4 Deploy
```

- Another task you might perform (multiple times) each day

- Another task you might perform (multiple times) each day



- *System alarm: SLOW_CONN*
- *Think of potential causes*
- *Collect evidence*
- *Run new tests*
- *<Repeat>*
- *Discover ultimate cause*
- *Write report*

- You might attempt to (again) capture as a program

find_alarm_cause.py

- You might attempt to (again) capture as a program

find_alarm_cause.py

?

No one has a solution...

- The solution seems to resist a general purpose program.
- A person, reasoning on a case by case basis, seems to be the only known solution.

- Is this system activity “normal” or should I do something?
- How many of what type of resources should I allocate to this process?
- …

- Is this system activity “normal” or should I do something?
- How many of what type of resources should I allocate to this process?
- Identify a person from an image
- What are company documents similar to this one?
- …

- Therefore the only way to do more, is by hiring more people.
- i.e., a fundamentally non-scalable process.

- Therefore the only way to do more, is by hiring more people.
- i.e., a fundamentally non-scalable process.

This is where AI is useful and can bring significant commercial value

- Automation: The answer is *known*, and one can write a program that executes this known solution.

- AI: Only *the problem statement* is known. Techniques from AI are applied to produce a program.

AI: Only *the problem statement* is known. Techniques from AI are applied to produce a program.

AI: Only *the problem statement* is known. Techniques from AI are applied to produce a program.

Once you have used AI to produce a program, it can be scaled with all the efficiencies of software.

Example: Alarm detection

Alarm type

SLOW_CONN

Example: Alarm detection

Alarm type

SLOW_CONN

Relevant events

Event	Timestamp
<event 1>	Jan 20 19:23:15
<event 2>	Jan 20 19:24:03
…	…
<event k>	Jan 21 00:01:13

Example: Alarm detection

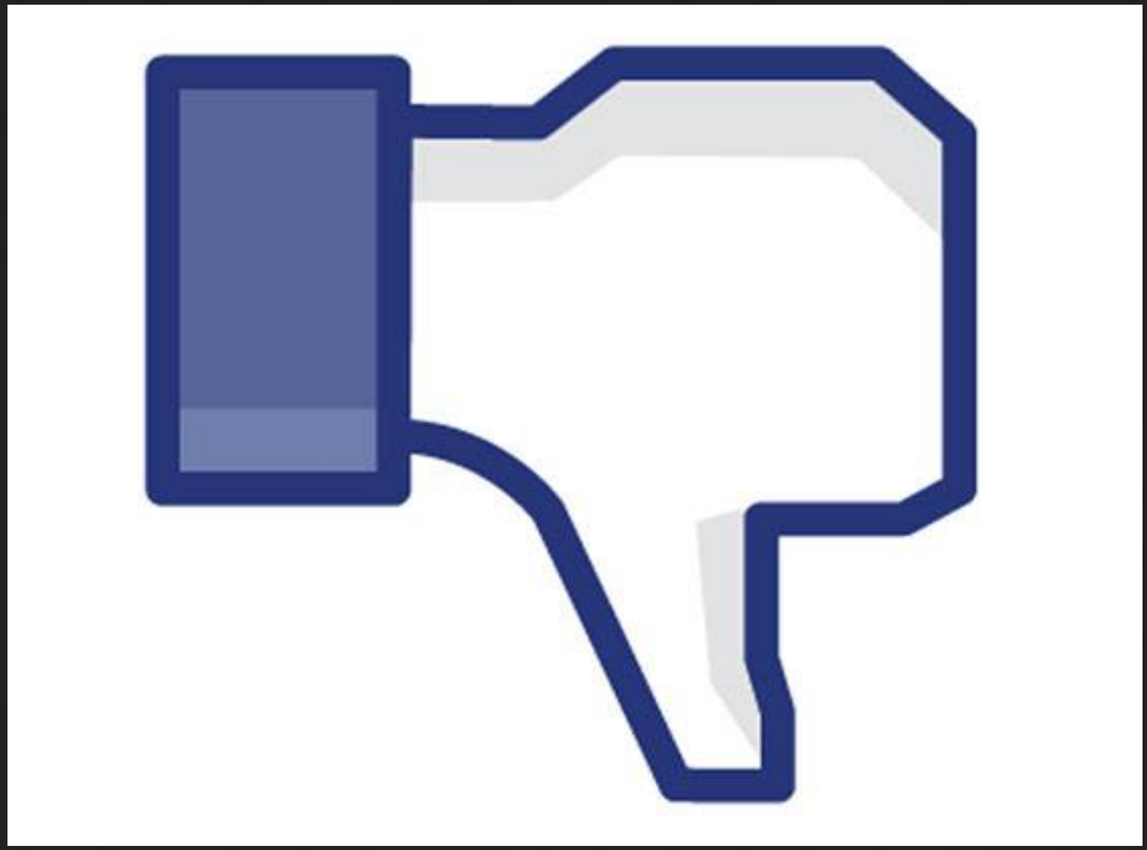
produce_alarm_report.py

```
0  acquire alarm type
1  find all events occurring at same time
2  score each event by relevancy
3  return events exceeding threshold
```

Example: Alarm detection

A process which used to take ***12+ hours of a person's attention***, for each incident, was reduced to ***1 hour***.

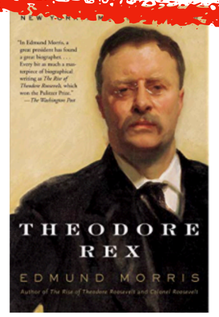
Example: Data integrity / quality



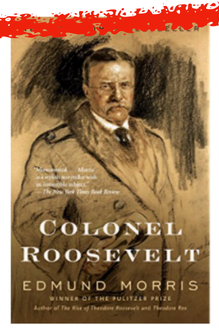
Example: Amazon

Customers who bought this item also bought

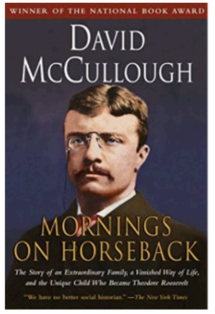
Page 1 of 17



Theodore Rex
› Edmund Morris
464
Paperback
$9.60 prime

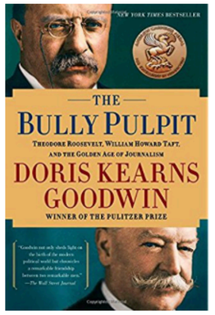


Colonel Roosevelt (Theodore Roosevelt)
› Edmund Morris
252
Paperback
$16.19 prime



Mornings on Horseback: The Story of an Extraordinary Family, a…
› David McCullough
596
Paperback
$14.22 prime

Strenuous Life (Little Books of Wisdom)
› Theodore Roosevelt
57
Hardcover
$9.40 prime



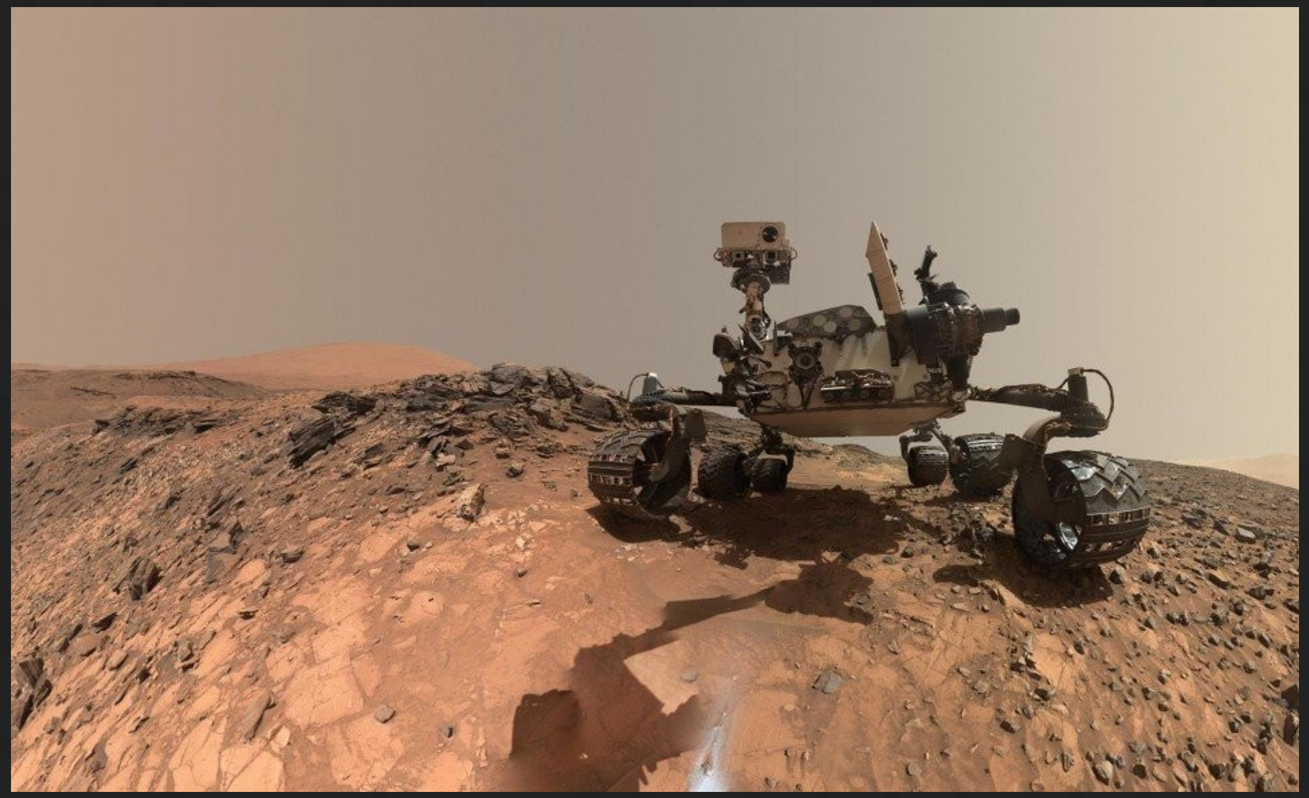
The Bully Pulpit: Theodore Roosevelt and the Golden Age of Journalism
› Doris Kearns Goodwin
2,051
Paperback
$12.21 prime

The Last Lion: Winston Spencer Churchill: Alone, 1932-1940
› William Manchester
1,560
Paperback
$19.23 prime

Integration of AI systems

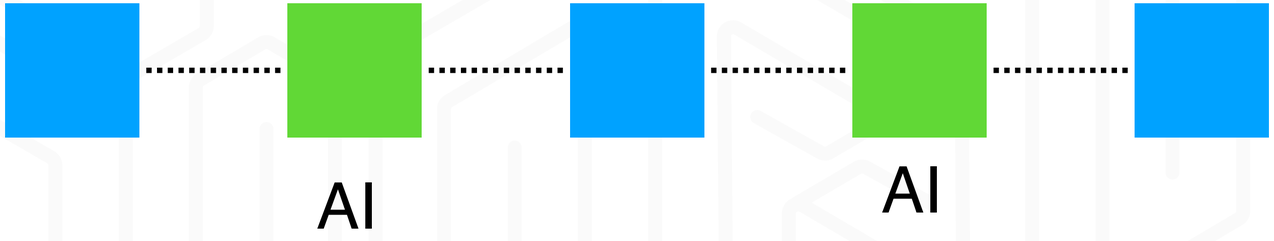
- An easy way to *deploy* an intelligent system is as a *proxy* for a person.

- An easy way to *deploy* an intelligent system is as a *proxy* for a person.
- Sometimes, it is required.

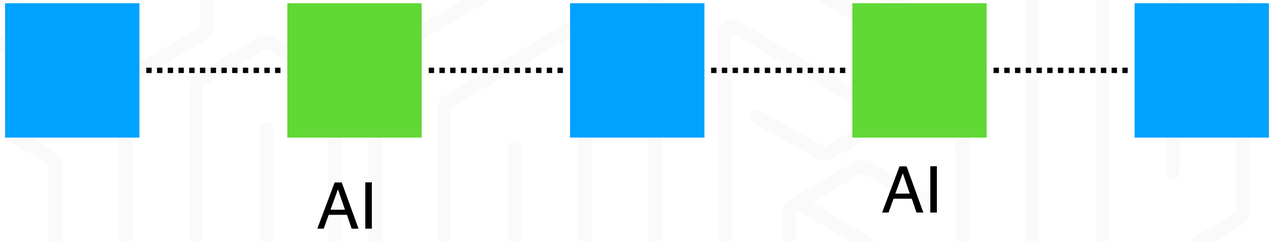


More generally, an existing workflow might be represented as a sequence of people performing well defined tasks.

More generally, an existing workflow might be represented as a sequence of people performing well defined tasks.

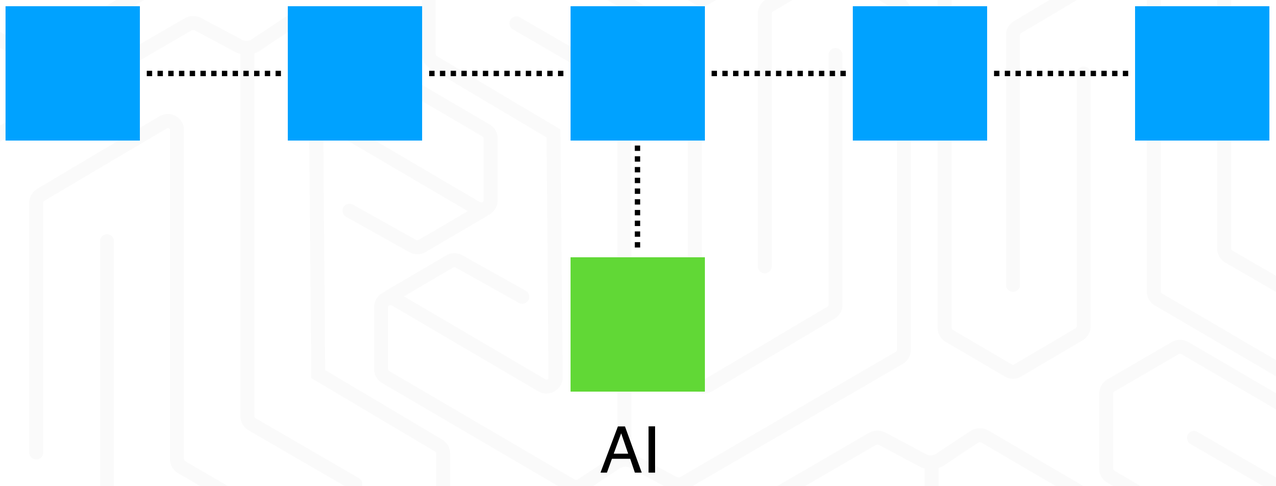


AI-as-proxy means replacing one or more with an intelligent system.



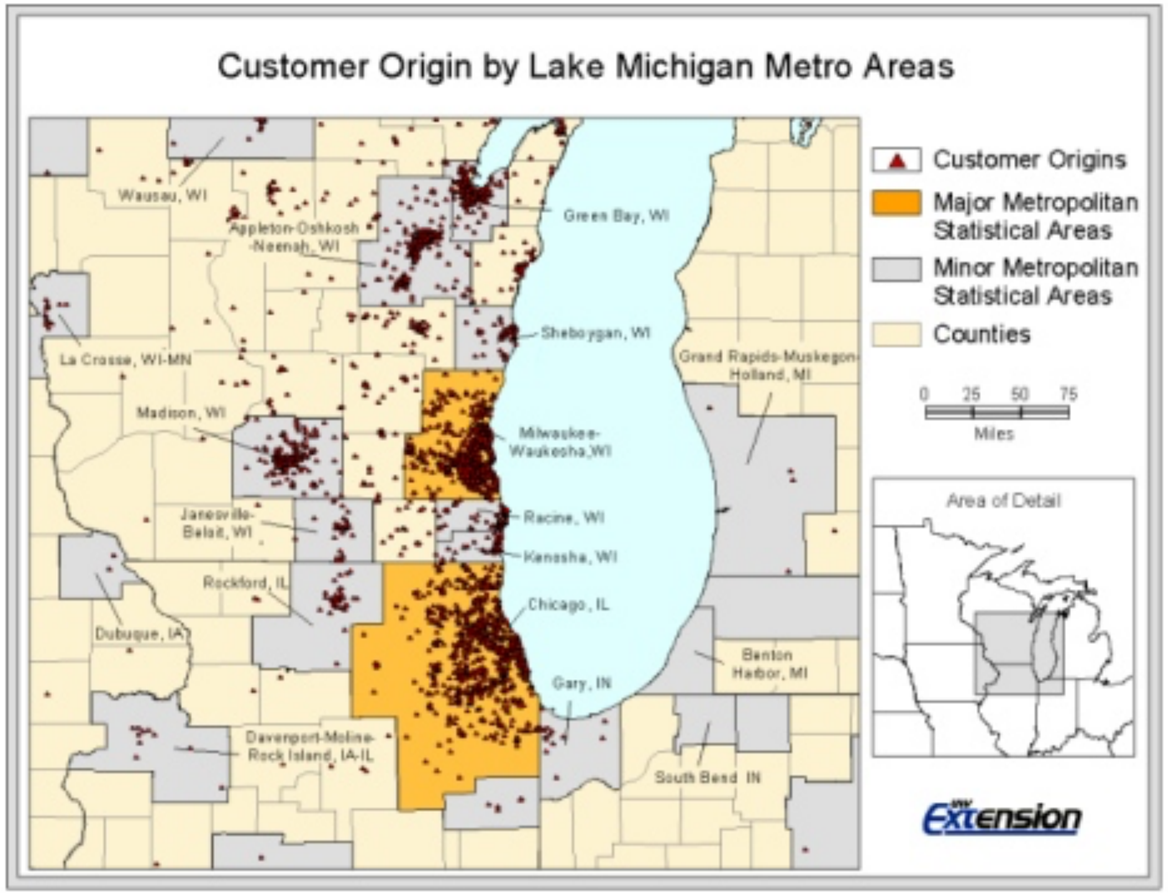
AI-as-proxy is one (but not the only) pattern for deployment.

AI as decision support

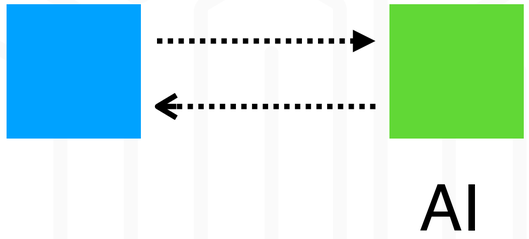


AI as decision support - title selection

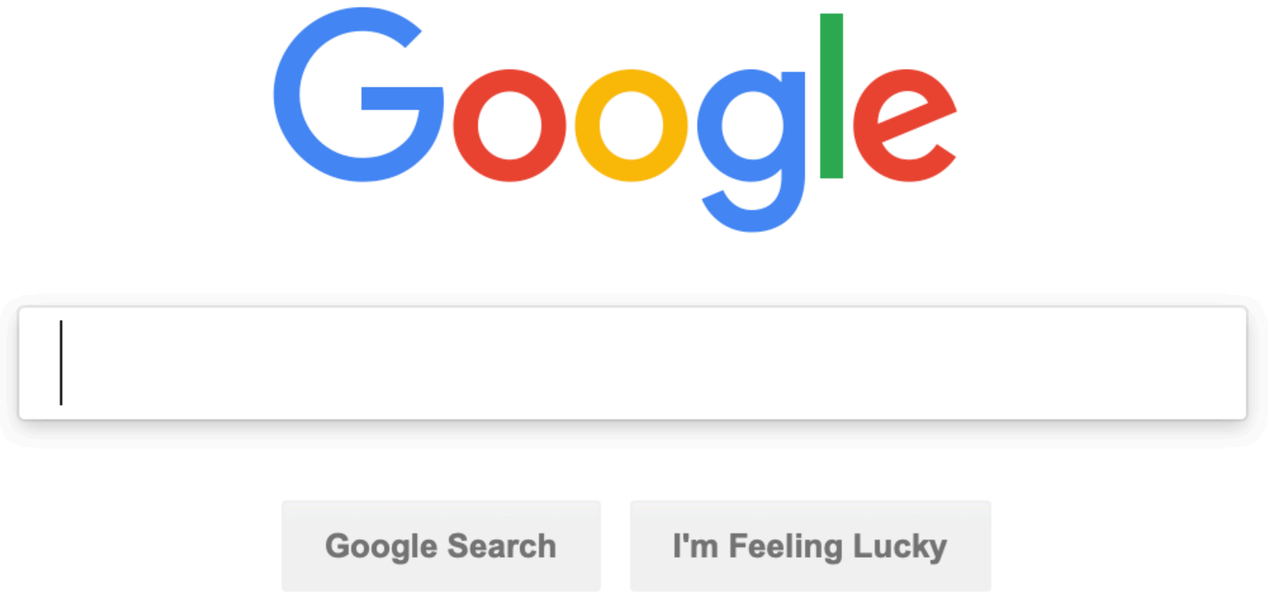
AI as decision support - retail location selection

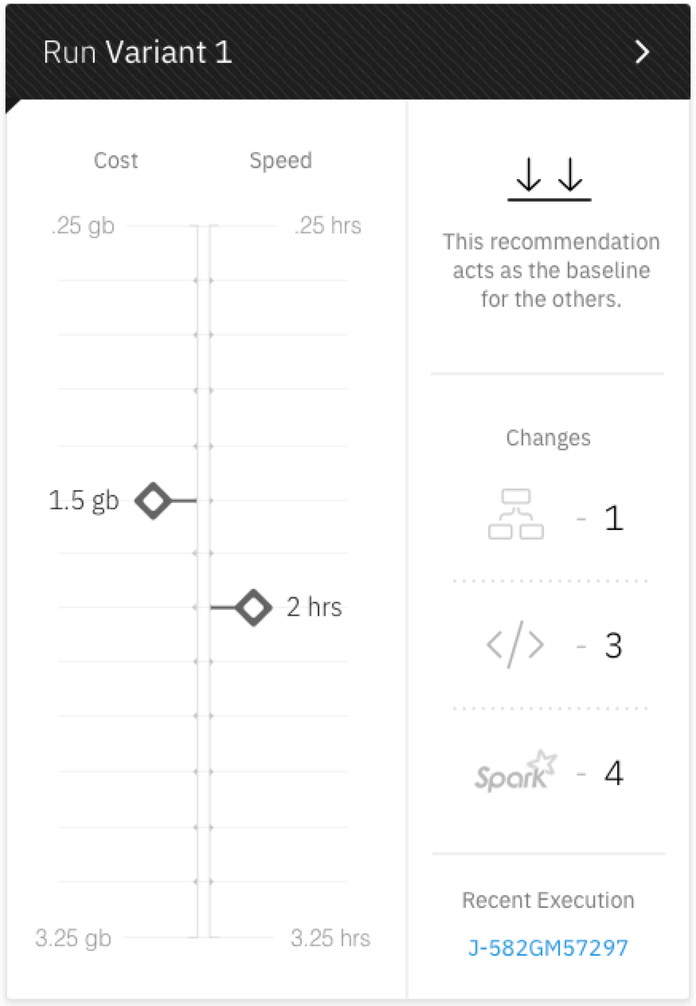


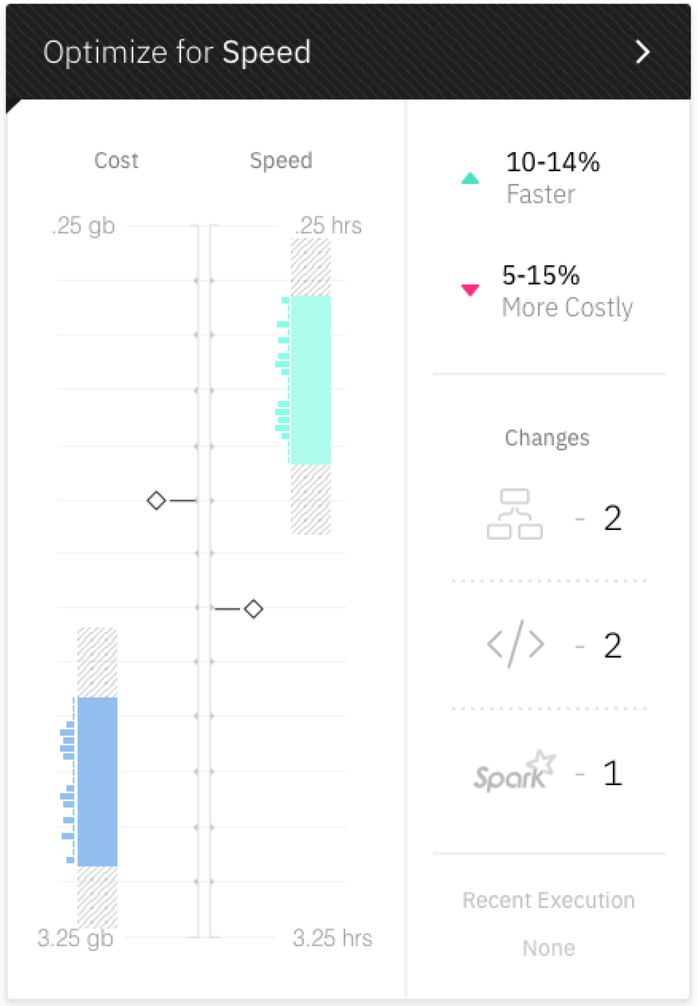
AI as collaborative tool

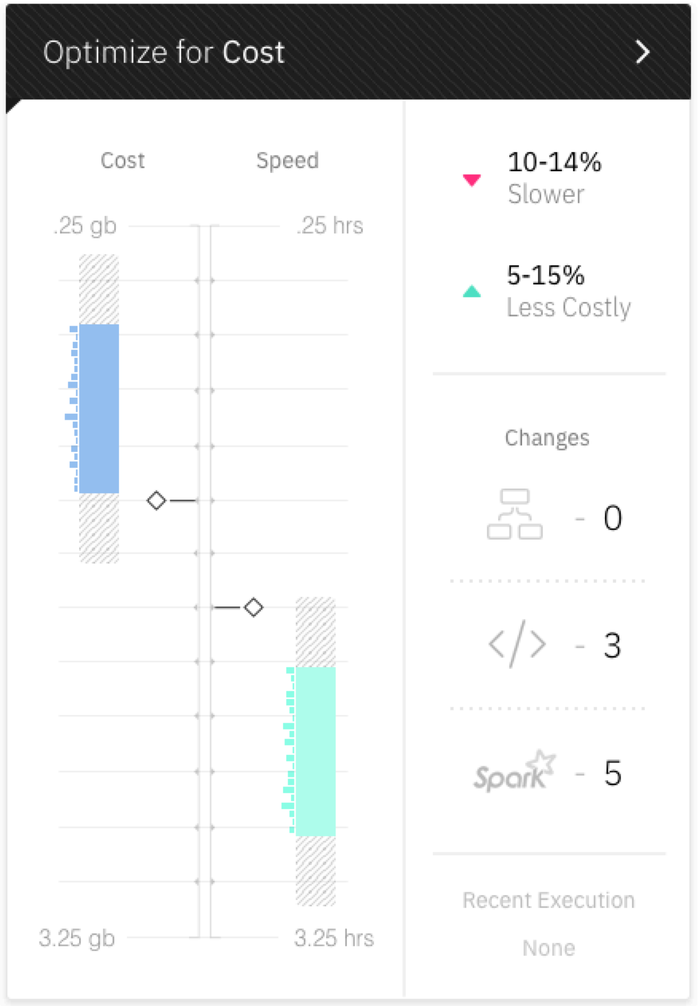


AI as collaborative tool - search

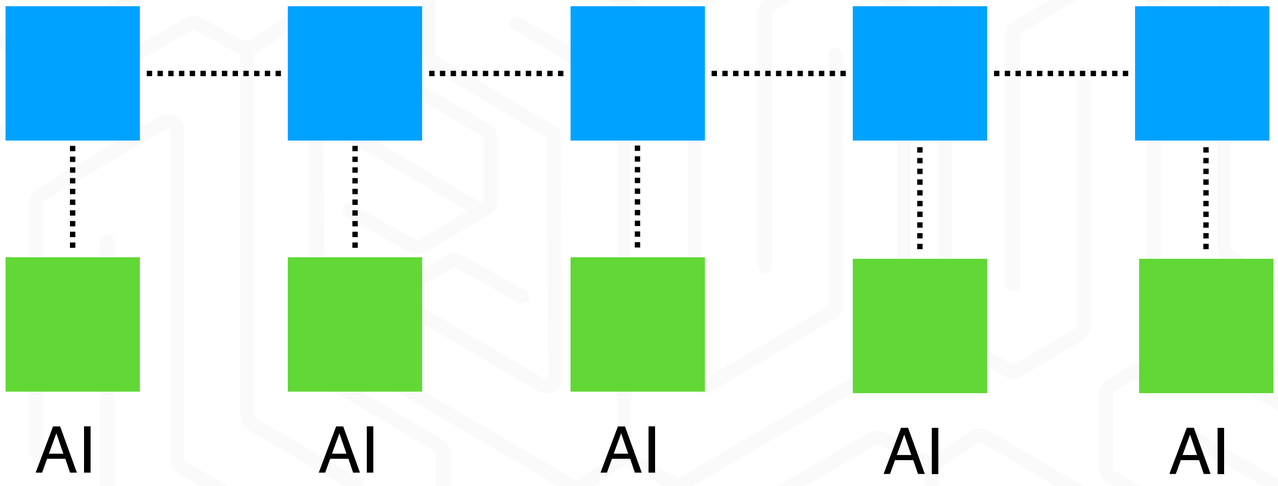


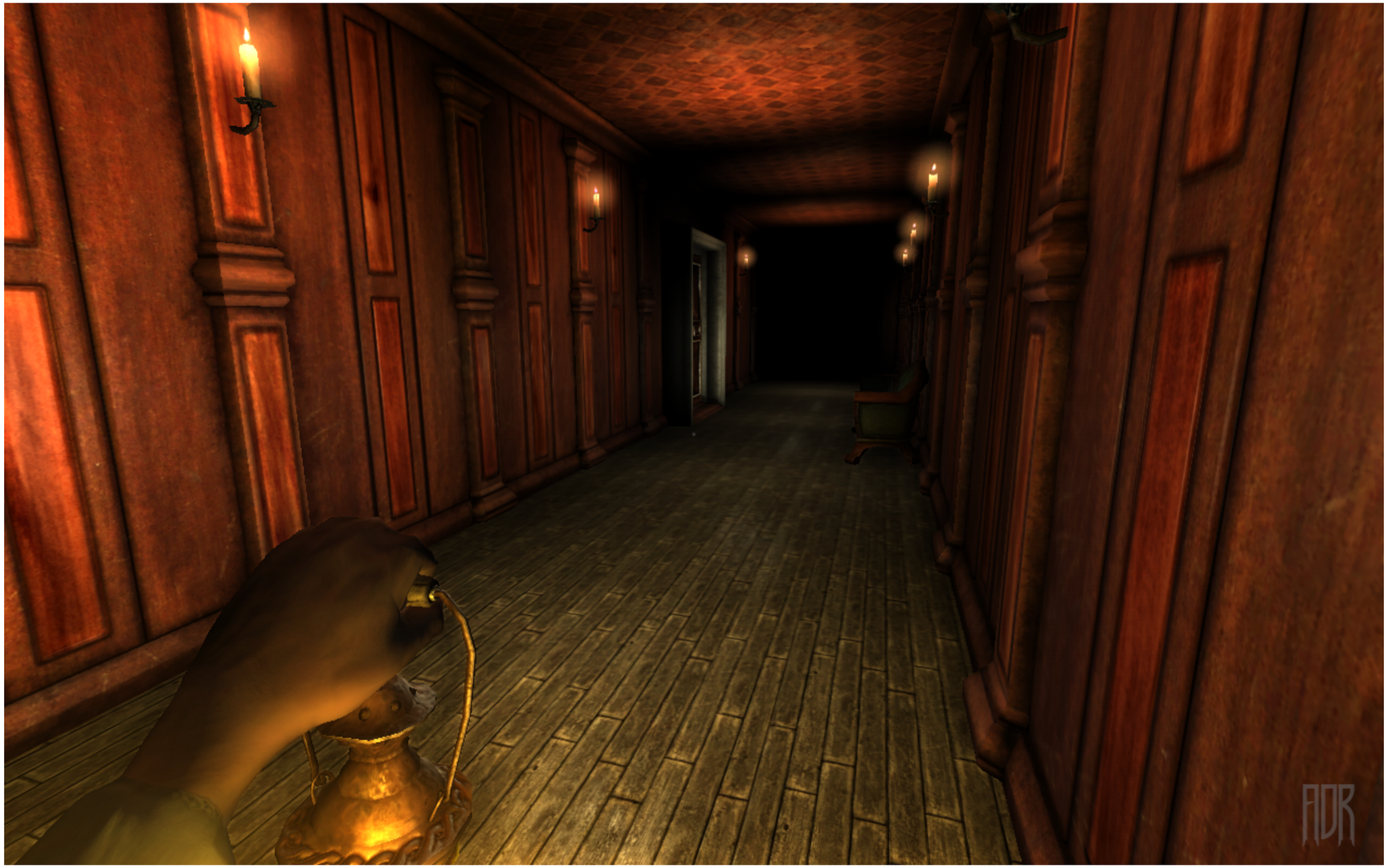

Run Variant 1
Cost
Speed
.25 gb
.25 hrs
1.5 gb
2 hrs
3.25 gb
3.25 hrs
This recommendation acts as the baseline for the others.
Changes
- 1
- 3
Spark - 4
Recent Execution
J-582GM57297


Optimize for Speed
Cost
Speed
.25 gb
.25 hrs
3.25 gb
3.25 hrs
10-14%
Faster
5-15%
More Costly
Changes
- 2
- 2
Spark - 1
Recent Execution
None

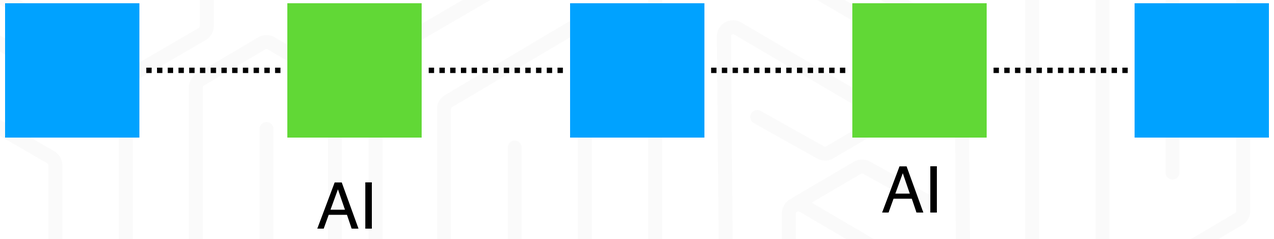

Optimize for Cost
Cost
Speed
.25 gb
.25 hrs
3.25 gb
3.25 hrs
10-14%
Slower
5-15%
Less Costly
Changes
- 0
- 3
Spark - 5
Recent Execution
None

AI for changing level of abstraction




AOR

AI enabled a new level of interface



AI-as-proxy

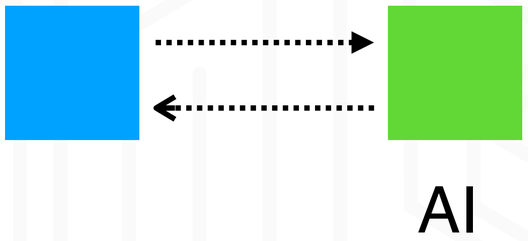
Leftover principle

- Tom Limoncelli - “Automation should be like Iron Man, not Ultron”
- Automate the easy parts. What’s left over is done by humans.

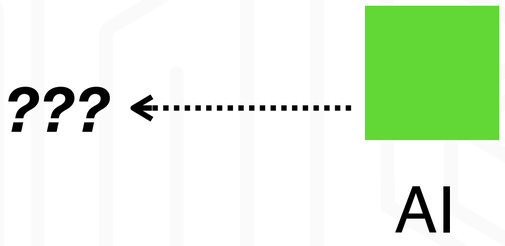
“This makes it very hard to crash an A330, and the plane had a superb safety record: there had been no crashes in commercial service in the first 15 years after it was introduced in 1994. But, paradoxically, there is a risk to building a plane that protects pilots so assiduously from even the tiniest error. It means that when something challenging does occur, the pilots will have very little experience to draw on as they try to meet that challenge.”

Tim Harford, “Crash: How computers are setting us up for disaster.” (2016) *The Guardian.*

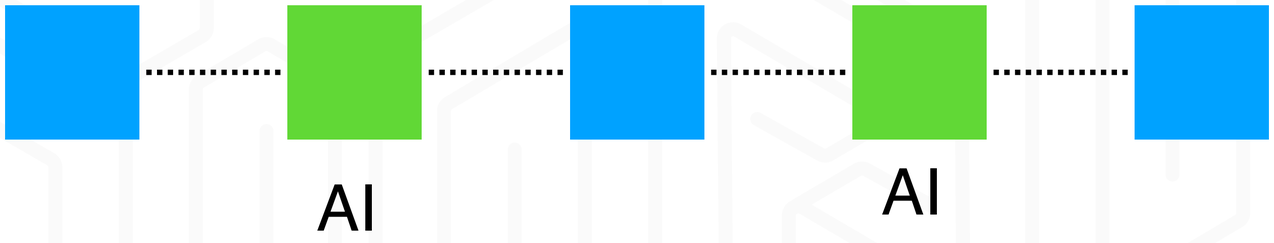
Issue #1: Validation



Issue #1: Validation



Issue #2: Fear



Solution: 1. Identify the right problem

Criteria

- Only solvable via human intuition
- Need more people to solve more instances
- Frequency of appearance is increasing

Solution: 2. Position initially as assistive tool

- This has *numerous* benefits
- The software isn't *doing* anything - the human operator has to approve recommendations.
- Over time - human operator uses experience and knowledge to verify solutions, *earning trust over time*.
- The software *learns from the operator's selections*

foodRev

foodRev

Donors

foodRev

Donors

Receivers

foodRev

Donors

Receivers

Volunteers

foodRev

Plan 1

- All demand is met
- Each volunteer goes on equal number of trips

foodRev

Plan 1

- All demand is met
- Each volunteer goes on equal number of trips

Plan 2

- All demand is met
- Uneven trip distribution
- Most people finish close to their home location

foodRev

- We *wanted* to provide a fully automated solution, but *could not*.
- The solution was to formulate selection from space of plans as a learning problem
- Over time, we came to learn what made one kind of plan better than another (and the coordinators came to trust the software).

Summary

- Automation is when the solution is *known*, and a program is written to execute that known solution.
- AI is when only the problem statement is known, and AI produces the program *for you*.
- This turns things that are completely unscalable, into a program, which can be scaled with cheap infrastructure.

Summary

- There are lots of ways to integrate intelligent systems into your organization.
- You can create openness by selecting the right problem.
- Start with an assistive solution, and gradually move towards a proxy approach.

Summary

- AI is *not* about having fewer people on staff.
- AI is about being a larger, more capable (as well as more efficient) organization, not reachable with people alone.

Thank you.

don@newcortex.ai
newcortex.ai